SCIENCE

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GRAVEL MAN AND PALÆOLITHIC CULTURE; A PRELIMINARY WORD.

BY W. H. HOLMES, SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

THE theory of a palæolithic man in eastern America has been before the archæological world for a number of years and much has been said *pro* and *con*. A large body of evidence, believed by advocates of the theory to be satisfactory and conclusive, has been collected and published, and theories, borrowed and evolved, have been promulgated, discussed, and modified until the literature of the subject has grown to imposing volume.

It should be observed, however, that the term "palæolithic" does not fully cover the ground. The subject is not a simple one. Two important questions are involved, and these should, for the sake of clearness, be treated separately. These questions are, first, Is there evidence of a glacial man in eastern America? and second, Is there evidence of a palæolithic or primal stage or period of culture? Although closely related in some respects, these questions are, in the main, independent of one another. The existence of an ice-age man may be proved without securing the least evidence of the existence of a palæolithic period, the latter expression implying a primal and well differentiated stage or period of art in stone. It is possible to collect a large body of objects of art from a given formation without being able to make any deductions whatsoever as to the particular stage of culture represented, since certain types of artificial products necessarily appear at all periods from the beginning to the end of the stone age, making hasty conclusions unsafe. On many sites representing middle neolithic culture of modern date countless numbers of flaked stones may be collected without the discovery of a single specimen that the advocates of a palæolithic man would not, three years ago, have called palæolithic. Practically the same conditions will no doubt be found to prevail on Aztec and Maya quarry sites, representing the most advanced stone-age culture.

On the other hand, the existence of a palæolithic, or primal stage of culture, if such there was in this country, may be proved independently of glacial gravel finds, for it is possible that such a stage of art may have existed before, during, or after the gravel-forming epochs. The proofs would be found in pre-glacial or post-glacial formations or upon inhabited sites of any period furnishing the necessary data; but demonstration is not easy in any case, as it is necessary in each instance to show that the art recovered is actually palæolithic art and not merely a partial representation of neolithic art — of the ruder tools or the rejects of an advanced people. The burden of proof rests with advocates of the theory, since they assume to introduce to the world cultures, peoples, and conditions not within the limits of ordinary experience.

It will be seen that in the discussion of these questions two distinct classes of testimony are involved, one dealing with the phenomena of human handicraft, and the other with the phenomena of geologic formations. These phenomena are complex and their relations obscure and subtle in a high degree, and it would appear that until students of the great questions of chronology and culture acquire a thorough scientific knowledge of geology as well as of all early phases of human art the discussions in which they indulge can be of little real value.

The fact is that the field has, up to this time, been occupied mainly by amateurs who have not mastered the necessary fundamental branches of science. The work done is mainly their work, the literature produced is mainly their literature, and the world has received its impressions from this source. This no doubt is an unavoidable condition of the evolution of archæologic science. It is necessary that all departments of investigation should pass through this novitiate or formative stage and the world of science must look with lenience upon the mistakes of the period, for that which is to-day or may be to-morrow is in great part the outcome of that which was yesterday. But the time has now come for a change — for the opening of an era when scientific acquirements of the highest possible order shall be brought to bear upon these questions. Anthropologists are now to unite with geologists in investigating the early history of man and his culture, just as the geologist has been for years assisting the biologist in unfolding the history of living things.

The requirements of the investigation may be briefly outlined and the present status of the evidence characterized. In the first place, the discussion of the early history of man requires a scientific knowledge of certain phases of art, including especially all flaked-stone art. Until very recently the origin, genesis, and history of artificially flaked stones have been but imperfectly understood. Those forms not properly designated implements were not separated from those properly so called, although it is found that the former probably greatly outnumber the latter, and as long as all were indiscriminately treated as implements their discussion was little more than a farce. The discussion of flaked-stone art in America has consisted mainly in describing and illustrating unfinished forms and rejects of manufacture as implements and in speculating on their possible age, functions and ethnic bearings. This fundamental misconception as to the nature of a large portion of flaked stones has led to most deplorable mistakes in interpretation, and erroneous theories of age and culture have been hatched and fed and still feed upon these primary blunders. The whole discussion of early man has been so surcharged with misconceptions of fact and errors of interpretation that all is vitiated as a stream with impurities about its source. Until an exhaustive scientific study of the origin, form, genesis, and meaning of all the handiwork of man made use of in the discussion is completed, the discussion of man and culture is worse than useless, and speculation can lead but to embarrassment and disaster.

The geologic aspects of the case are hardly more satisfactory than are the anthropologic. In the discussion of the early history and chronology of man and his arts geology must play a prominent part. Two questions, for whose answers we must appeal to this science, are constantly arising, first, What is the age, or relative age, of the formations concerned in human chronology? and, second, What is the exact nature of the association of works of art with these formations. It is readily seen from the nature of these questions that they require expert answers, but persons unskilled in geologic science cannot be expected to give expert answers. Those persons who have turned their attention to these studies have not, as a rule, been competent to determine the age or relative age of the sedimentary deposits, and they were equally incompetent to determine, in obscure cases, the exact relations of associated works of art with these formations, although constantly essaying to do so. I have for many years been engaged more or less fully in geologic work, but so obscure are the phenomena of the glacial and post-glacial formations, that I do not permit myself to make and use any observation in which these phenomena are seriously involved without consulting one or more geologists of the highest standing in that particular field. There are so many chances for error in observation and so many pit-falls for the unwary theorist, that it may well be questioned whether or not the student of archæology not highly skilled in geologic sci

ence can be justified in seeking unaided to enlighten the world upon these questions.

The fact is that a large part of the literature relating to the palæolithic and ice-age questions is so hopelessly embarrassed with the blunders and misconceptions belonging naturally to the initial stages of the investigation that it is but little more than a stumbling-block to science, notwithstanding the possibility that there may be many hints of truth in what has been written. It would appear to be a more collossal task, however, to discover these hints of truth in the literature of to-day than to wrench them afresh from the rocky tomes of nature.

In conclusion, I would add that if there was, as is claimed, an ice-age man or at any time a palæolithic man in eastern America, the evidence so far collected in support of these propositions is so unsatisfactory and in such a state of utter chaos that the investigation must practically begin anew. That it will begin anew is rendered practically certain by the facts that geologists are now showing a decided disposition to take up that part of the work naturally belonging to them; and that primitive forms of art in stone are now for the first time receiving the critical attention necessary to make them available in a scientific discussion. Thus it appears that the suggestion embodied in the title of this communication may not be wholly unwarranted and inappropriate.

THE NEST OF THE TRAP-DOOR SPIDER.

BY D. CLEVELAND, SAN DIEGO, CALIFORNIA.

The trap-door spider (*Mygale henzii* Girard) is widely diffused in California. While wandering over the Mesa (table lands), just back of this city a few months ago I was struck by the great number of their nests in favorable localities. In the adobe land hillocks are numerous; in fact, in many places, they are as thick as the ground will permit. They are about a foot in height, and some three or four feet in diameter. These hillocks, which are an interesting formation in themselves, are selected by the spiders, apparently, because they afford excellent drainage, and cannot be washed away by the winter rains. Their stony summits are often as full of spiders' nests as they well can hold. These subterranean dwellings are shafts sunk vertically in the earth, except where some stony obstruction compels the miner to deflect from a downward course. These shafts are from five to twelve inches in depth, and from one-half to one and a half inches in diameter, depending largely upon the age and size of the spider.

When the spider has decided upon a location, which is always in clay, adobe or stiff soil, he excavates the shaft by means of the sharp horns at the end of his mandibles, which are his pick and shovel and mining tools. The earth is held between the mandibles and carried to the surface. When the shaft is of the required size, the spider smooths and glazes the wall with a fluid which is secreted by herself. Then the whole shaft is covered with a silken paper lining, spun from the animal's spinnarets.

The door at the top of the shaft is made of several alternate layers of silk and earth, and is supplied with an elastic and ingenious hinge, and fits closely in a groove around the rim of the tube. This door simulates the surface on which it lies, and is distinguishable from it only by a careful scrutiny. The clever spider even glues earth and bits of small plants on the upper side of his trap-door, thus making it closely resemble the surrounding surface.

The spider generally stations itself at the bottom of the tube. When, by tapping on the door, or by other means, a gentle vibration is caused, the spider runs to the top of his nest, raises the lid, and looks out and reconnoitres. If a small creature is seen, it is seized and devoured. If the invader is more formidable, the door is quickly closed, seized and held down by the spider, so that much force is required to pry it open. Then, with the intruder looking down upon him, the spider drops to the bottom of his shaft.

A young friend of mine has spent much time lately watching and investigating the operations of this spider. He found by many experiments—all with the same result—that when the door of his nest is removed, the spider can renew it five times—never more than that. Within these limitations, the door torn off in the evening was found replaced by a new one in the morning. Each successive renewal showed, however, a greater proportion of earth, and a smaller proportion of silk, until, finally, the fifth door had barely enough silk to hold the earth together. The sixth attempt, if made, was a failure, because the spinnarets had exhausted their supply of the web fluid. When the poor persecuted spider finds his domicil thus open and defenceless, he is compelled to leave it, and wait until his stock of web fluid is renewed.

From forty to fifty cream-colored spiderlings are hatched from the yellow eggs at the bottom of the nest. When these have attained only a fraction of their full size—before they are half grown—their affectionate mother drives them out into the world to shift for themselves. After a brief period of uncertainty, they begin active life by making nests, each for itself, generally close to "the old homestead," sometimes within a few inches of it. These nests are always shallow and slender, and are soon outgrown. When the spider attains its full size it constructs a larger nest.

The spider is seldom seen outside of its nest, which it rarely leaves—during the day, at least, and then only for a few minutes, and for a short distance. Upon any alarm, it hastens to its nest, lifts the door, which quickly springs back into its place, and is held down by the householder until the alarm has subsided.

I now have a large nest, containing a mother and her yellow spiderlings, which I am carefully watching and studying.

BALANCES OF THE PERUVIANS AND MEXICANS.

BY WALTER HOUGH, WASHINGTON, D.C.

THE employment of weights and measures among the existing uncultivated peoples is a subject upon which but little information has been gathered. The following instances of the use of balances and weights in pre-Columbian America are interesting from an archæological point of view.

In the Archæological Museum of Madrid there are two pairs of balances and four beams, from sepulchres of the Yncas at Pachacamac, Peru. The possession of this probably oldest weighing appliance by the ancient Peruvians is very curious. A flat strip of bone suspended edgewise by a cord midway forms the beam. To the ends of the beam are hung, by short cords, slings of net-work made of fine thread, the free edges being strengthened by cord.

One of these balances is plain, while the beam of the other is elaborately fretted and engraved with circles-and-dots, and curves outlining the fretted spaces. Red paint has been rubbed in these incisions. The long suspending cord is strung alternately with a row of small beads of turquoise and red and white shell and a large, flat, oblong piece of shell pierced through the axis. The string is terminated by the figure of a bird and a fret ornament of shell representing a seated human figure with head-dress. Three small pendants of beads and shell hang below this and the whole forms an ornate and striking specimen.

One of the beams exhibited is of bone, ornamented with circles-and-dots, so regular, that they would appear to indicate the use of another instrument of precision, the compass.

Dr. Brinton has ascertained that the weights were small stones.[1] It would seem that, for the purpose of equalization of weights, the equilibrium of the beam being gauged by the eye, these balances are quite accurate. They are in perfect order at the present time.

In the Mexican collection at the Columbian Historical Exposition in Madrid there are two spherical objects of basalt, from the ancient Tarascos of Michoacan, which Dr. Troncoso, director of the Mexican National Museum, believes are weights. He supports this view by stating that at present the Indians use similar stone weights on their imperfect balances, which are formed of two small trays of wood, each suspended by three strings from the end of a wooden beam, which is balanced by a cord fastened at the middle.

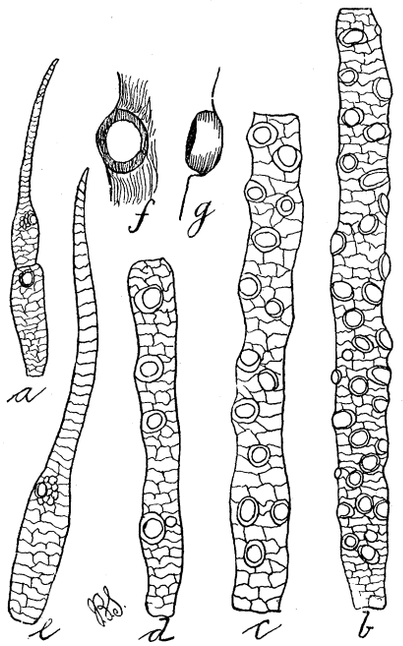
It is possible that the use of the balance will be found to have been more extensive in America than is suspected.

[1] Proceedings Numismatic and Antiquarian Society, Philadelphia, 1891.

AN INTERESTING SENSORY ORGAN IN CERTAIN PLANT LICE.

BY JOHN B. SMITH, SC D., RUTGERS COLLEGE.

DURING the season of 1890 plant-lice were unusually abundant and destructive on a number of cultivated crops in New Jersey, and I devoted some little time to the study of the more troublesome species, presenting the results, in popular form, in Bulletin No. 72 of the New Jersey Agricultural College Experiment Station. One of the matters that attracted my attention more particularly was the peculiar pitting of the antennæ. These pits and tubercles, as they have been indifferently called, are well known; but they have been often treated as merely sculptural features, and no special importance has been attributed to them. In my examinations of the structures I recognized them as sensory in character; but was not then and am not now able to specify their exact function, since they differ from what are usually described as the tactile and olfactory organs. The appended figure, showing the pittings of the antenna of the peach-louse, will serve to illustrate the appearance of the structures.



PEACH LOUSE: — *a*, Antenna of young louse; *b*, First long joint of winged form; *c*, Second long joint; *d*, Third long joint; *e*, Whip-joint; *f*, Sensory pit of antenna, from top; *g*, Same, from side.

I found that in all the wingless forms of all the species examined by me one type only was present. There is a single large pit, surrounded by a little group of small pits, on the last or whip-joint and, usually, a single large pit near the tip of the penultimate segment. This structure never changes in character while the insect remains wingless, whether it is newly-born or has reached a point where it reproduces its kind agamically. It continues also throughout the pupa state; but as soon as the winged form is assumed a very decided change appears, and every species shows a pitting peculiar to it. It may involve all the joints or only one may be modified; but, whatever the type, it is invariable within specific limits, and I have not found thus far any two species in which the pitting is identical. It may be that where a species is dimorphic, or where there are migratory and sedentary forms, that each form may have peculiarities of structure; but this I do not know.

At the time I made the studies above mentioned, I had neither males nor oviparous females of any species before me, and not until the fall of 1892 was I in position to examine sexed individuals carefully. I was curious to find whether any further modifications appeared in the true sexes, and whether the wingless, oviparous females shared in the larval type of structure. I obtained males and females of *Aphis brassicæ*, *Siphonophora cucurbitæ*, *S. rosæ*, *Myzus cerasi*, and *Phorodon humuli*. In the males of all, as I expected, I found the antennal pittings present, and was not unprepared to find that they differed from the viviparous winged forms in their somewhat greater number and distinctness. I was disappointed to find in the oviparous female no modification of the simple larval type; but, as I was in search of some character that would always distinguish this particular form without recourse to the primary sexual structures, I examined all parts of the insects minutely, and was rewarded by finding on the posterior tibiæ a series of sensory pittings exactly similar in structure to those of the antennæ in the male. I found that these structures differed in each of the species examined, in size, arrangement, and number, and the character is probably as little variable here as it is in the antenna. *Myzus cerasi* was the only species in which I had any number of specimens for examination, and in this I found that the tibial pitting does not appear until the insect becomes sexually mature.

To ascertain whether other species showed the same structure, I wrote Dr. C. V. Riley, asking whether he had observed it or could inform me as to its presence or absence in other species. Recently he very kindly replied as follows: "I have not yet been able to examine all the material at hand, but I can say that I have verified your interesting discovery in the following species: The pits are present in *Aphis mali*, *A. pruni*, *Myzus nahaleb*, *Siphonophora rosæ*, *Siphonophora sp.* on rose, *Callipterus sp.?* on oak, in *Phyllaphis fagi*, and in *Melanoxanthus salicti*. I do not find them present in the following genera: *Schizoneura*, *Glyphina*, *Pemphigus*, and *Phylloxera*, while in *Lachnus* they are not at all well developed or distinctly observable. This list, so far as it goes, would, therefore, show that they occur in what may be looked upon as the higher forms, and are absent in the *Pemphiginæ* and *Phylloxerinæ*."

I have not seen any mention of the structures above described, and am less than ever able to attribute a function to them. Finally, I desire to express my obligation to Dr. Riley, who not only examined the species mentioned in his letter, but also sent me the sexed specimens on which my studies were first made.

THE INDIANA ACADEMY OF SCIENCE.

THE eighth annual meeting of the Indiana Academy of Science convened in the rooms of the State Board of Agriculture, Capitol Building, Indianapolis, Ind., Dec 28, 1892, and continued through the 29th. The president was Professor J. L. Campbell of Wabash College, Crawfordsville, Ind. The meeting was one of universal interest. The attendance was large; the list of papers showed 92 titles, almost all of which were read.

The officers chosen for the year were: President, J C. Arthur, Purdue University, Lafayette, Ind.; vice-president, W. A. Noyes, Rose Polytechnic Institute, Terre Haute, Ind.; secretary, Amos W. Butler, Brookville, Ind.; assistant secretary, Stanley Coulter, Purdue University, Lafayette, Ind.; treasurer, C. A. Waldo, DePauw University, Greencastle, Ind.; auditors, Thomas Gray, Rose Polytechnic Institute, Terre Haute, Ind.; W. S. Blatchley, High School, Terre Haute, Ind.; programme committee, L. M. Underwood, DePauw University, Greencastle, Ind.; W. A. Noyes, Rose Polytechnic Institute, Terre Haute, Ind.

The arrangements for the spring meeting the third week in May contemplate a two days' session in the picturesque and interesting region in Park County, closing with a session Friday evening at Terre Haute.

The editors presented their report and also the first volume of the Academy's Proceedings ready for distribution. The volume contains the papers of the last preceding meeting together with an account of the field meetings, a bibliography of all papers read before the Academy since its organization in 1885, together with reference to the place of publication of each.

The following papers were presented: —

Notes on the Reproduction and Development of *Grinnellia Americana* Harv., M. A. Brannon; Evidences of Man's Early Existence in Indiana, from the Oldest River Gravels along the White Water River, A. W. Butler; On the Construction of a Sensitive Galvanometer, Benj. W. Snow; Some Facts as to the Varying Conditions of Rock Deposits as Observed in the Hudson River

Beds of Indiana and an Inquiry as to the Cause of the Same, Joseph Moore; A Simple Air Thermometer for the Determination of High Temperatures, W. A. Noyes; Test of the Torsional Strength of a Steel Shaft, Thomas Gray; An Extreme Case of Parasitism, Robert Hessler; Exhibition and Explanation of a Geological Chart, Elwood P. Cubberly; Local Variations, C. H. Eigenmann; Botanical Field-Work in Western Idaho, D. T. MacDougal.

When this stage on the programme was reached, the hour for noon adjournment arrived. It was then decided to meet in three sections in the afternoon, in order to accommodate members who were present with papers. The next morning, it was understood, the general sessions would be resumed. The three sections organized were, A, mathematics, physics, chemistry, and geology; B, botany; C, zoölogy and anthropology. In them the following papers were presented: —

The Quaternion Treatment of the Motion of Two or More Bodies under the Law of Gravitation, A. S. Hathaway; The Electrical Oxidation of Glycerin, W. E. Stone and H. N. McCoy; Notes Concerning Tests of the Purdue Experimental Locomotive, W. F. M. Goss; The Electrostatic Theory of Cohesion and Van der Waal's Equation, Reginald A. Fessenden; On Sulphon-Pthaleins, Walter Jones; Quartz Suspensions, Benj. W. Snow; Observations on Glacial and Pre-Glacial Erosion at Richmond, Indiana, Joseph Moore; A Modification of Grandeau's Method for Determination of Humus in Soils, H. A. Huston and F. W. McBride; Experiments with and Phenomena of Vacuum Tubes, R. A. Fessenden; The Extraction of Xylan from Straw in the Manufacture of Paper, W. E. Stone and W. H. Test; The Electro-Magnetic Inertia of a Large Magnet, Thomas Gray; The Determination of Chlorine in Natural Waters, W. A. Noyes; Some New Electrical Apparatus, R. A. Fessenden; Thiofurfurol and its Condensation Products, W. E. Stone and Clinton Dickson; On the Construction and Use of a Bolometer, B. W. Snow; On the Determination of Valence, P. S. Baker; An Application of Mathematics in Botany, Katharine E. Golden; On the Fertilization and Development of the Embryo in *Senecio aureus*, D. M. Mottier; Distribution of North American Cactaceæ (by title), John M. Coulter; *Marchantia polymorpha*, not a Typical or Representative Liverwort, L. M. Underwood; Notes Concerning Certain Plants of the South-Western Counties of Indiana, John S. Wright; Spines and Epidermis of the Cactaceæ (by title), E. B. Uline; Preliminary Notes on the Genus Cactus, E. M. Fisher; An Auxanometer for the Registration of Growth of Stems in Thickness, Katharine E. Golden; The Apical Growth of the Thallus of *Fucus vesiculosus*, D. M. Mottier; Symbiosis in Orchidaceæ, M. B. Thomas; Notes on Pediastrum, W. L. Bray; The Genus Corallorhiza, M. B. Thomas; Notes on Root Tubercles of Indigenous and Exogenous Legumes in Virgin Soil of the North West (by title), H. L. Bolley; Notes on Archæology in Mexico, J. T. Scovell; Notes on the Loss of the Vomerine Teeth with Age in the Males of the Salamander, *Desmognathus fusca* (by title), F. C. Test; Modern Geographical Distribution of Insects in Indiana (by title), F. M. Webster; New Species of Indiana Hymenoptera, reared at LaFayette, Indiana (by title), F. M. Webster; Description and Elevation of Mount Orizaba, J. T. Scovell; The Climate and Glaciers of Mounts Orizaba and Popocatepetl, J. T. Scovell; A Mite, probably *Hypoderas columbæ*, Parasitic in the Pigeon, W. W. Norman; The Locustidæ of Indiana with Description of New Species, W. S. Blatchley; Early Stages in the Development of Cymatogaster, C. H. Eigenmann; Some Remarks Regarding the Embryology of Amphiuma, O. P. Hay; Some Structural Peculiarities of Pacific Slope Fishes (by title), A. B. Ulrey; Peculiar Death of an Oriole (by title), T. B. Redding; The Range of the American Crossbill (*Loxia curvirostra minor*) in the Ohio Valley, with Notes on its Unusual Occurrence in Summer, A. W. Butler; A Note on Loxia curvirostra, W. S. Blatchley; Notice of a Terrapin to be Restored to the Fauna of Indiana, O. P. Hay; A Migration of Birds and One of Insects, T. B. Redding; The South American Catfishes Belonging to Cornell University (by title), E. M. Kindle; Notes on the Genus Lytta, W. P. Shannon; The Icthyologic Features of the Black Hills Region, B. W. Evermann; Explorations in Western Canada, C. H. Eigenmann.

In the evening the Academy convened to listen to the address of President Campbell on "The Inter-Dependence of Liberal Pursuits."

At the general Session of the second day the following papers were presented: —

Ancient Earthworks near Anderson, Indiana, Francis A. Walker; The Work of the U. S. Fish Commission Steamer Albatross, in the North Pacific and Behring Sea in 1892, B. W. Evermann; A Thermo Regulator for Rooms Heated by Steam, J. C. Arthur; Archæology of Tippecanoe County, O. J. Craig; Some Indian Camping Sites near Brookville, A. W. Butler; Relation of Kings County Traps to Those of Cumberland County, N.S., V. F. Marsters; The Traps of Red Head, N.B., V. F. Marsters; On Birds in Western Texas and Southern New Mexico (by title), A. W. Butler; An Account of Vegetable and Mineral Substances that Fell in a Snow-Storm in LaPorte County, Jan. 8–9, 1892 (by title), A. N. Somers; How a Tendril Coils, D. T. MacDougal; Remarkable Pre-Historic Relic, E. Pleas; The Bruns' Group of Mounds, H. M. Stoops; Some Points in the Geology of Mount Orizaba (by title), J. T. Scovell; Two-Ocean Pass (by title), B. W. Evermann; The Blattidæ and Phasmidæ of Indiana, W. S. Blatchley; Forestry Exhibit of Indiana at the Columbian Exposition, Stanley Coulter; The Yolk Nucleus, J. W. Hubbard; Some Causes Acting Physiologically toward the Destruction of Trees in Cities, J. C. Arthur; British Columbia Glaciers, C. H. Eigenmann; A State Biological Survey — a Suggestion for Our Spring Meeting, L. M. Underwood; The Mounds of Brookville Township, Franklin County, Ind., H. M. Stoops; How the Colleges Could Aid the Public Schools in Teaching Biological Subjects, W. W. Norman; Notes on the Flora of the Chilhowee and Great Smoky Mountains, Stanley Coulter; The Need of a Large Library of Reference in Cryptogamic Botany in Indiana, What the Colleges Are Doing to Supply the Deficiency, L. M. Underwood; Exhibition of a Series of Grouse and Ptarmigan from Alaska, B. W. Evermann; Botanical Assemblies in the United States Announced for the Year 1893, J. C. Arthur; Development of Ovule in Aster and Solidago (by title), G. W. Martin; Remarks on Archæological Map-Making (by title), A. W. Butler; The "Lilly Herbarium" and Its Work, John S. Wright; Additional Facts Regarding Forest Distribution in Indiana, Stanley Coulter; Rotary Blowers, John T. Wilkin; Some Effects of Mutilation on the Forms of Leaf and Sex of *Morus alba* and *Morus nigra* (by title), A. N. Somers; The Crawford Mound (by title), H. M. Stoops.

LIFE-SAVING.

BY DELOS FALL, ALBION, MICH.

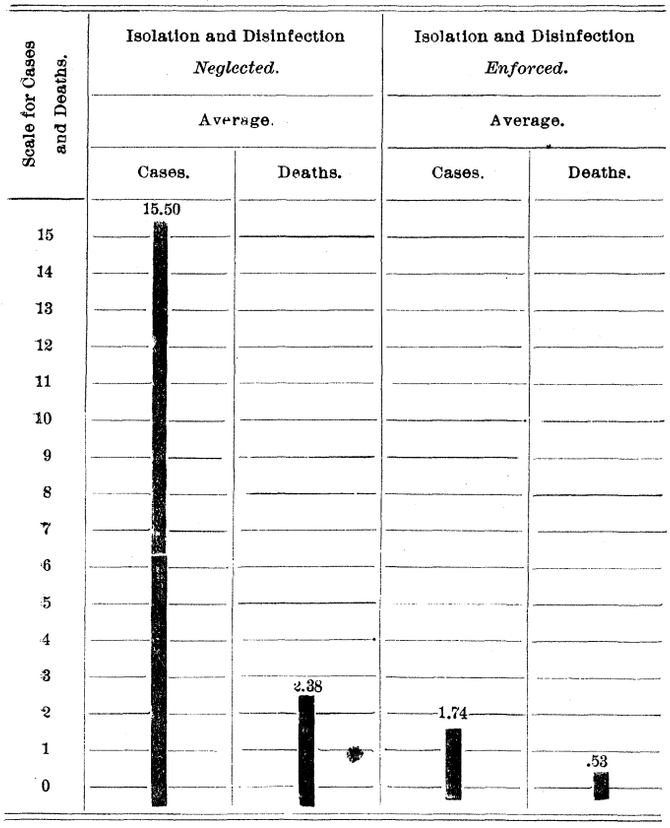
SANITARIANS are in the habit frequently of advancing claims in regard to the practical value of their work, resulting, they say, in a great lessening of sickness and the actual saving of many lives. For example, in a carefully prepared paper, read before the Sanitary Convention at Vicksburg, Dr. Baker, secretary of the Michigan State Board of Health, gave official statistics and evidence, which he summarized as follows: —

"The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and local boards of health in Michigan can justly 'point with pride.' It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet-fever, and nearly six hundred lives per year saved from death by diphtheria — an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man who 'made two blades of grass grow where only one grew before.'"

It has occurred to the writer that even scientific workers look upon such statements with a large degree of allowance. They can be demonstrated, however, as the following will illustrate: The table below is compiled from reports of local health officers to the secretary of the State Board of Health relative to the cases of sickness and deaths from diphtheria in Michigan during

the year 1888. The reports taken for this study deal with 92 outbreaks. In 34 of these the sanitary precautions of isolation and disinfection were neglected; in 58 outbreaks these preventative measures were enforced.

Diphtheria in Mighigan in 1888: Exhibiting the average numbers of cases and deaths *per outbreak*; in those outbreaks in which isolation and disinfection were both *neglected*; and in those outbreaks in which both were *enforced*. Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.



It will be seen that if in all the 92 cases isolation and disinfection had been neglected, the total number of cases of sickness would have been $92 \times 15.5 = 1426$; and the number of deaths would have been $92 \times 2.38 = 219$.

On the other hand, if all had been done that could have been done, if all possible means had been employed, there would have been $92 \times 1.74 = 160$ cases of sickness, and $92 \times .53 = 49$ deaths. The saving in sickness would have been $1426 - 160$ cases, and the saving of life would have been $219 - 49 = 170$.

But the whole number of outbreaks of this disease in Michigan during the year was 311. Applying the same reasoning as before, first, if isolation and disinfection were neglected in every case, there would have been $311 \times 15.5 = 4820$ cases of sickness and $311 \times 2.38 = 740$ deaths. On the other hand, if all had been done that ought to have been done, there would have resulted $311 \times 1.74 = 541$ cases of sickness and $311 \times .53 = 171$ deaths. The total saving in sickness would have been $4820 - 541 = 4279$, and the saving of life would have been $740 - 171 = 569$.

These figures are at the same time a justification of the claims which health officers make, suggested above, and a demonstration of the efficacy of the means employed, isolation and disinfection, in producing these results.

NOTES AND NEWS.

THE partnership heretofore existing between Geo. L. English, E. C Atkinson, and Wm. Niven, as Geo. L. English & Co., has been dissolved by mutual consent. Geo. L. English, having purchased all the stock, good-will, and fixtures, will continue the business under the same firm name. The firm has removed to a new ground-floor store, No. 64 East 12th Street, five doors east of Broadway, three doors west of Fourth Avenue. They have purchased the business of Mr. Philip Fuchs, who for ten years was in the employ of Tiffany & Co., and more recently has been in business for himself. Mr. Fuchs has entered their employ, and a complete lapidary equipment, including five lathes, has been put in the new store. Very much more attention will be given to gems, especially rare stones, and they propose materially enlarging this department and carrying a good stock. Among gems now on hand are willemite, oligoclase, beryllonite, diopside, sphene, obsidian, phenacite, demantoid, peridote, prehnite, hiddenite, garnet, amethyst, cat's-eye, aquamarine, golden beryl, emerald, chrysoberyl, moonstone, rubellite, turquois, zircon, opal, sapphire. Any other gem will be secured. Mounting done to order. Microscopical sections of rocks and minerals will be manufactured on the premises and a good stock kept on hand. Their enlarging stock of meteorites will soon be worthy of prominence.

— During the past summer courses of instruction were offered by professors and instructors of Cornell University in Greek, Latin, French, German, English, philosophy, mathematics, physics, chemistry, botany, drawing, and physical training. In all there were a hundred and fifteen in attendance, representing twenty-two States and Territories, Canada, and Japan; and of these far the greater part were teachers and advanced students. The private venture, begun so auspiciously, has now taken a more permanent form, and the school has been made an integral part of the university. The list of courses offered for the summer of 1893 is greatly increased, and among the additions to the corps of instruction of last summer are Professors Wheeler and Bristol and Dr. Laird in Greek, Professor Bennet in Latin, Professor Smith in elocution and oratory, Professor Tichener in psychology, Professor Williams in pedagogy, Professor Wilcox and Dr. Hull in social and economic science, Professor McMahon in mathematics, and Professor Hitchcock in physical training. Summer courses in the school of law will also be offered this year for the first time, instruction being given by the entire faculty of the school.

— The third annual meeting of the American Morphological Society was held at Princeton College, Dec. 27 and 28, under the presidency of Dr. C. O. Whitman of the University of Chicago. The meeting was well attended, and several additions were made to the list of members, which includes the majority of the active workers in the department of animal morphology in this country. The following is a list of the papers presented at the meeting: Dr. E. B. Wilson, Columbia College, The Cleavage of the Ovum and the Teloblasts of Amphioxus; Dr. C. W. Stiles, the Agricultural Department, Washington, The Topographical Anatomy in the Family Tæniadæ; Dr. E. O. Jordan, University of Chicago, The Maturation and Fertilization of the Egg of the Newt; Professor E. D. Cope, Philadelphia, False Elbow-Joints in Man and the Horse; Mr. Arthur Willey, Columbia College, On Acinetæ Parasitic in the Buccal Tube of Diplosoma; Dr. C. B. Davenport, Harvard College, On the Development of the Cerata of Eolis; Dr. H. B. Ward, University of Michigan, On the Host of Nectonema; Dr. C. O. Whitman, University of Chicago, The Metamerism of Clepsine; Dr. W. B. Scott, Princeton College, The Evolution of the Premolars; Dr. H. Ayers, the Lake Laboratory, Milwaukee, The Ending of the Auditory Nerves in the Hair-Cells; Dr. E. A. Andrews, Johns Hopkins University, Notice of a New Sort of Amphioxus; Professor A. E. Verrill, Yale College, Some New Forms of Menerteans; Dr. T. H. Morgan, Bryn Mawr College, Preliminary Note on Balanoglossus; Professor B. Sharp, Academy of Natural Sciences, Philadelphia, Joint-Formation among the Invertebrata; Professor W. A. Locy, Lake Forest University, The Formation of the Medullary Groove and Some Other Features of Embryonic Development in the Elasmobranchs. The officers of the Society for the current year are: President, Dr. C. O. Whitman, University of Chicago; vice-president, Dr. E. B. Wilson, Columbia College; secretary and treasurer, Dr. J. Playfair McMurrich, University of Cincinnati; members of the executive committee elected from the society at large, Dr. T. H. Morgan, Bryn Mawr College, and Dr. C. B. Davenport, Harvard College.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE AMERICAN PSYCHOLOGICAL ASSOCIATION.

ONE of the most significant meetings that occurred during the Christmas holidays was that of the American Psychological Association in Philadelphia on Dec. 27 and 28. This was the first regular meeting of this body, a temporary organization having been effected in June last. The coming together of psychologists is significant not alone of the rapid strides which this science has recently been making, but particularly of the unity of method and subject matter which the introduction of scientific modes of observation into this controverted field has made possible. This association of psychologists is composed almost exclusively of specialists who are studying the nature of mental processes by the help of ingeniously devised apparatus, are propounding new problems and adopting new methods to their solution, and, in brief, are proceeding with that painstaking vigor and caution characteristic of all phases of modern science. For these reasons an account of their proceedings necessarily becomes somewhat technical; but this moderate element of technicality is itself a welcome relief from that over-popularization and almost sensational publicity in which a line of activity too often confused with psychology has indulged.

The meeting was called to order by the president of the association, President G. Stanley Hall, of Clark University, and the reading of papers began with a paper by Professor Catell, of Columbia College, on "Errors of Observation in Physics and in Psychology." Professor Catell criticised that line of psychophysical observation in which the liability to degree of error was taken as a standard of the sensibility for differences. He considered that the entire subject needed re-investigation, with a complete separation of these two points. He also regarded that recent experiments of his own and Professor Fullerton tended to show that the errors of observation do not fall under the law as usually stated (Weber's law) but approximate the law which the distribution of errors demanded.

A very interesting problem was presented by Dr. Witmer, of the University of Pennsylvania, in an account of a research upon the æsthetics of visual form. Dr. Witmer attempted to determine, by a large number of experiments, such questions as, What are the most pleasing forms? What proportions of the division of a line, and what proportions of the relations of the height to the breadth of a rectangle are the most pleasing? and the like. The results of these preferences were interpreted by reference to the general outline of the field of vision, of which the figures form a part. He showed conclusively that the former views of the conditions of such æsthetic judgments were inadequate, and that this neglected factor of the position of the figure with reference to the edges of the field of vision was a most important one. The experiments will be continued and give promise of contributing some measure of system and order to a field usually regarded as determined by caprice.

President Hall presented a brief outline of the history and prospects of experimental psychology in America, tracing the beginnings of this study from the first laboratory founded at Johns Hopkins University some eight years ago, up to the present time, when there are as many or more psychological laboratories established in this country than in all Europe. The rapid dissemination of interest in psychological studies and the material provisions for its future development were ably presented, and various measures of credit judiciously assigned. The publication of such a review of the purposes, methods and results of the new psychology, as President Hall outlined, should certainly contribute much towards a more general understanding of what psychology and psychologists are doing and—equally important—not doing.

Professor Jastrow, of the University of Wisconsin, gave an account of the exhibit of experimental psychology, which is to be made at the World's Fair. Here, for the first time, the attempt will be made to gather together various types of apparatus which are used in psychological research, to maintain in running order a working laboratory, in which simple tests of the senses, powers of judgment, the times of mental processes, the peculiarities of association, the limits of memory, of fatigue, and the like, may be made and recorded; and to exhibit in some measure the results of statistical and other forms of research. Considerable expenditure, the co-operation of colleges, of individual psychologists and of makers of apparatus have been secured for the successful completion of this large task. It is hoped that this somewhat comprehensive exhibit of the method and aims of this new science may aid in disseminating a truer and more appreciative view of the theoretical and practical value of this line of research than has yet been accomplished.

Professor Münsterberg, of Harvard University, upon the request of the president, addressed the association, speaking of the problems that were engaging his attention at his laboratory at Cambridge. No less than fifteen subjects of investigation are here in progress, and the nature of some of these Professor Münsterberg described in a very interesting manner. The impetus to work in this direction, which his acceptance of the chair at Harvard has given, has already made itself evident, and, before the year is over, many important results will undoubtedly be issued from his laboratory. The subjects under investigation covered a wide range, from the determination of the methods of localizing sounds in space, and a new method of determining when differences of sensation may be regarded as equal, to complicated experiments upon the nature of association, of changes in mental condition, of complex forms of reaction, and the like.

Dr. Sanford reported some of the minor studies which are in part completed and in part in progress at the laboratory of Clark University. One of these studies gave an account of the fluctuations in mental power at different portions of the day, as determined by the capacity to remember a series of arbitrary impressions. Another dealt with the frequency and character of dreams of subjects who every night at once recorded their dreams upon awakening from them. The great frequency of dreams, the fact that they are concentrated in the early hours of the morning, that they are so largely based upon actual experiences, and that recent events contribute much to their content,—these and other points clearly appeared in the analysis which this material furnished.

Professor Bryan, of the University of Indiana, presented two papers, in one of which he gave an account of experiments establishing the effect of the intensity of the stimulus upon the reaction time; and, in the other, described some tests which had been made in schools of Springfield, Mass. These tests show the development of motor power in children at different ages, and brought out many unexpected and significant relations.

Papers were also read by Dr. Nichols, of Harvard College, presenting some novel experiments upon illusions of rotation and upon the sense of pain; by Professor Pace of the Catholic University of Washington, describing some observations upon the power of judging the thickness of surfaces held between the thumb and forefinger; by Dr. Witmer, describing the results of a few simple reaction times, taken upon a great variety of unpractised subjects; other papers of a somewhat philosophical nature were presented by Dr. Chamberlain, on the "Relation of Psy-

chology to Anthropology," and Dr. Aikens on an "Analysis of Cause."

The meeting adjourned, to meet next December, at Columbia, N. Y. The officers of the association are: G. Stanley Hall, president; Professor Ladd of Yale University, vice-president; and Professor Jastrow of the University of Wisconsin, secretary.

ASSOCIATION OF AMERICAN ANATOMISTS.[1]

The following persons were elected to membership: —Herbert S. Birkett, M.D., Montreal, Canada, Demonstrator of Surgery, McGill University; Tracy Earl Clark, B.S., Clinton Liberal Institute, Ft. Plain, N. Y.; J. Milton Greenman, Assistant Director Wistar Institute of Anatomy, University of Pennsylvania; James W. Hartigan, M.D., Morgantown, W. Va., Professor of Biology, University of West Virginia; Geo. S. Huntington, M.D., New York City, Professor of Anatomy, College of Physicians and Surgeons; Peter J. McCourt, M.D., New York City; Middleton Michel, M.D., Charleston, S. C., Professor of Physiology, Medical College of South Carolina; Wm. B. Scott, Princeton, N. J., Professor of Geology and Paleontology; Wm. Anderson, F.R.C.S., etc., London, England, Demonstrator of Anatomy, St. Thomas's Hospital College (honorary); C. S. Minot, S.D., Harvard Medical School, Professor of Histology and Embryology; C. A. Hamann, M.D., Assistant Demonstrator of Anatomy, University of Pennsylvania.

The executive committee, through the secretary, reported that the circular in regard to information concerning the Negro race was nearly ready.

The following papers were then read: 1. Crania of the Cetacea. 2. The human lower jaw, Dr. Harrison Allen, University of Pennsylvania. These two papers were illustrated by specimens and discussed by Professor Herrick and by Professor Geo. Macloskie of Princeton University. 3. History of the development of bone-tissue. Illustrated by microscopic slides. Dr. Carl Heitzmann, New York City. Discussed by Professors Macloskie and William Libbey, Jr., of Princeton University.

The following quotation is an extract from Dr. Allen's presidential address: "It is now four years since the Association of American Anatomists was founded, with a list of fifteen members. Many were the objections raised when it was proposed to organized a new society. Eminent professors declared that it was not needed; others, while sympathizing with its objects, were convinced that the list of members would be so small that it would be a difficult matter to fill the necessary offices. The fact that an active membership exists of ninety-four persons, representing twenty-two States, the District of Columbia and the United States army, sufficiently meets both the above-mentioned objections. It tells us unmistakably that the society is needed, and that not only are the offices filled, but that the association is recognized as a devoted band of students whose activity compares favorably with that of other scientific organizations.

"But the work thus far accomplished is but the harbinger of what it is hoped may be undertaken. An attempt at co-operation between the American Anatomists is to be brought before you at this meeting. The executive committee will present a plan by which observations on the anatomy of the Negro shall be entered upon. It is earnestly hoped that every teacher and demonstrator of anatomy in the country, whether a member of this society or not, will assist its committee in accumulating observations on this class of subjects."

4. An anomalous development of the human sternum. Specimen and remarks by Dr. D. S. Lamb, Army Medical Museum, Washington, D. C. Discussed by Dr. Dwight. 5. Discovery of an ossified thyroid cartilage and a supposed rudimentary clavicle in an Artiodactyl. Professor Wm. B. Scott, Princeton University. Specimen exhibited. Discussed by Professor Cope and Dr. Allen. 6. Observations on the psoas parvus and pyramidalis. A study of variations. Dr. Thomas Dwight, Harvard Medical School. 7. Significance of percentages in reversions in human anatomy. Professor H. F. Osborn, Columbia College, New York City. Discussed by Professor Cope and Drs. Dwight and Lamb.

3 P.M. session resumed. The following papers were read: 8. Histogenesis in the brain, and its bearings on development and decline. Professor C. L. Herrick, Dennison College, Granville, Ohio. Discussed by Drs. Heitzmann and Piersol. 9. The metapore or foramen of Magendie, with photographs. Professor B. G. Wilder, Cornell University. In the absence of Professor Wilder, the paper was read by Mr. Clark. Discussed by Professor Herrick. 10. Neuromerism and the cranial nerves of Ophidia. Professor Herrick. 11. The insula of the pig. With specimens. Discussed by Drs. Allen and Dwight. 12. Note on diagrams of the spinal cord. Dr. J. T. Duncan, Toronto, Canada. Read by the secretary, and referred to the Committee on Nomenclature. 13. Duration of motion of human spermatozoa. Professor Geo. Piersol, University of Pennsylvania. Discussed by Drs. Spitzka and Heitzmann.

Thursday, Dec. 29, 1892. The report of the Committee on Nomenclature, Dr. Wilder, secretary, was presented. The reading of the report was dispensed with, copies having been placed in the hands of the members present.

The following papers were read: 14. The innervation of the organ of Corti. Howard Ayers, Ph.D., Curator of the Lake Laboratory, Milwaukee, Wis. Microscopical slides with remarks. 15. The posterior surface of the liver, as described by Vesalius. Dr. F. H. Gerrish, Bowdoin College, Maine. Discussed by Drs. Dwight, Allen, and Heitzmann. 16. Embryos of bats. With specimen and plates. Dr. Allen. Discussed by Professors Cope and C. S. Minot. 17. Meckel's diverticulum. Dr. D. S. Lamb, Army Medical Museum, Washington. Discussed by Drs. Dwight and Minot. 18. Delimitation of abdominal regions. Dr. E. A. Balloch, Howard University, Washington. Read by the secretary. 19. The need of agreement in the limits of the adbominal regions. Dr. Gerrish. The last two papers were discussed together by Drs. Dwight, Piersol, Kemp, Heitzmann, and Lamb. It was decided that, with the consent of the authors, copies of these papers be sent to the committee on this subject appointed by the Anatomical Society of Great Britain and Ireland; and also to the committee of the German Anatomical Society. 20. Physical characteristics of the Kootenay Indians of South Eastern British Columbia. Professor Alex. F. Chamberlain, Clark University, Worcester, Mass. Read by title. 21. Series of thirty-five natural-size photographs of sections of human brain, with brief remarks. Dr. I. S. Haynes, University of New York.

[1] Fifth annual session, at Princeton, N. J., December 27, 1892. Dr. Harrison Allen, of Philadelphia, president; Dr. D. S. Lamb, U. S. A., secretary.

NOTES ON THE OCCURRENCE OF RUBELLITE AND LEPIDOLITE IN SOUTHERN CALIFORNIA.

BY HAROLD W. FAIRBANKS, BERKELEY, CAL.

THE work of the California State Mining Bureau has recently brought into notice a very interesting association of minerals in San Diego County, California. The most important of these are lepidolite and rubellite. The former remarkable for the great quantity and purity in which it occurs, and the latter for its exquisitely radiated crystal aggregates. The ruby-tinted tourmaline imbedded in the pale lilac-colored mica presents a picture of beauty rarely equaled in the mineral kingdom. Before giving a detailed description of the occurrence of these minerals, a few words on the general geology of the district may not be out of place.

San Diego, the southern county of the State, is dominated by one main system of mountains known as the Peninsula Range. This consists of a confused mass of mountains and valleys rising gradually from the coast to the summit, forty miles inland, from which the descent is quite abrupt to the Colorado Desert. The average height of the watershed is about four thousand feet, but toward the northern boundary of the county, Mount San Jacinto reaches an altitude of about ten thousand feet. This Peninsula Range consists chiefly of granite which often takes on a dioritic facies. Dark basic diorite and rocks of the norite type occur as intrusions of considerable magnitude. Quartzite, mica schist, and thin bedded gneisses form long, nar-

row areas extending a little west of north and east of south. They represent extremely metamorphosed remnants of the original sedimentary formation.

Lying on the west of the summit of the range and extending parallel with it is a strip of granitic country filled with irregular dikes or veins of coarsely crystallized quartz, feldspar and muscovite; or frequently of feldspar and quartz only, in the latter case taking on a pegmatitic structure. Black tourmaline in irregular crystals is generally characteristic of these dikes.

The rubellite and lepidolite are found associated with an immense dike of this character near Pala, a short distance west of the foot of Smith's Mountain. The dike occurs in one of the norite bosses which forms a high hill over half a mile across. Similar bodies of pegmatitic rock are found in the granite in the vicinity but contain no rubellite. The outcrop is tracible along the eastern slope of the hill for nearly three thousand feet, in places forming a precipitous ledge. It gradually increases in width toward the southern end, where it is three hundred feet across.

It is near one edge of this great mass of pegmatite, and inclosed in it, that the minerals in question occur.

The northern portion of the dike contains no tourmaline; the dominant character being that of a very coarse muscovite granite, with a sprinkling of minute garnets. Both large and small bodies of finely formed pegmatite lie apparently wholly isolated in the coarse granite.

As the dike is followed southward to a point about midway in its course, crystals of black tourmaline begin to appear in abundance. One crystal ten inches long appeared broken into a dozen pieces, which had been moved a slight distance apart but were perfectly angular. The quartz-feldspar matrix showed no signs of crushing, and it is difficult to understand how the appearance could have been produced unless the crystal existed prior to the consolidation of the yielding magma.

Parallelism of the smaller and more slender crystals is often to be observed as taking place about the larger ones. Green tourmaline is present in small amount. It does not generally show any crystalline form, but is disseminated in small granular particles irregularly or aggregated about the black tourmaline.

The lepidolite appears here first in small irregular patches. A few yards to the south it forms a well-defined vein, and is filled with minute needle-like crystals of rubellite. Quartz crystals with fairly well defined boundaries are scattered through it.

At the point where the lepidolite reaches its greatest width, about sixty feet, it contains very little rubellite and is quite massive and pure save for granular aggregates of an acid plagioclase feldspar, probably oligoclase. It is near the southern end of this great body of lithia mica that the rubellite appears in the large radiated aggregates. Fan-shaped clusters of rubellite also occur in the quartz and feldspar adjoining the lepidolite. Single crystals in these groups are often fifteen inches long and one-half inch in diameter. One cavity containing good quartz crystals has been found, and it is possible that with farther exploration gem tourmalines may be found. Many of the smaller crystals in the lepidolite are clear and of good color, but are full of checks.

The rubellite crystals are generally gathered in radial aggregates six inches to a foot in diameter, but sometimes occur singly. Single crystals appear with smaller ones branching from one end presenting a tree-like form, or two or more intersect each other so as to form a cross. The aggregates are sometimes slender, with a slightly wavy course. The crystals either branch outward without any order or they all incline one way, giving the appearance of a fern. In other specimens lines of crystallization radiate from a common centre; curved or club-shaped crystals branching from each line. Hematite is sometimes found coating the tourmaline crystals.

Nine minerals are thus found associated together here—quartz, feldspar, muscovite, garnet, hematite, oligoclase, green, red, and black tourmaline.

A somewhat similar occurrence of minerals is reported from the mountains of Lower California, but nothing is known about it.

The granitic portions of the Sierra Nevada and Peninsula Ranges contain but few rare or beautiful minerals, and on that account the deposit at Pala is all the more remarkable.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Snake Story.

APPROPOS of the interesting notes on snakes, lately published in your columns, I would like to relate the following: —

I think it was about the middle of last June that our little boy, who is interested in collecting various natural history objects, brought home a full-grown water-snake. He procured a box of generous dimensions, one whole side of which he covered with wire-screen, such as is used in windows. A small slide was made in the top of the box, so that the porcelain tray (such as photographers use for developing trays), which he placed within, could be kept filled with water, and also for the introduction of food.

This box was thenceforward "the snake den," and here the snake passed the remainder of its existence. A small frog, several grasshoppers, and various insects were dropped through the opening in the top of the box from time to time, but we are not sure whether the snake ever deigned to taste a morsel during her entire captivity; certain it is, however, that if she did finally taste the frog, she did not find it a very appetizing meal, for the little frog hopped about in the box for days and days without any food itself. It was just as apt to rest upon the body of the snake as anywhere else, each seemingly indifferent to the presence of the other. The grasshoppers also were entirely ignored. The snake was left in the box, in the back-yard, during the months of July and August, with no care whatever, we being absent during that time, and the little boy who had agreed to look after it having deserted it.

What was our surprise, after our return early in September, to find one day that Mrs. Snake had giving birth to thirteen little ones. Such a little, writhing, squirming, snaky mass! The little snakes were about five inches long, and soon became quite active. In the course of a few weeks they were much more ready to take their own part than their mother seemed to be. She had probably learned by experience that it was of little or no avail to "fight back," and contented herself with running out her forked tongue when irritated, and then trying to creep out of harm's way. The little ones, on the contrary, would crawl up the screen as far as possible, and when pushed off, with a straw or wire introduced through the screen, they would at once crawl up again, run out their little tongues, and show all the rashness of youth.

Wondering how far the maternal instincts were developed in the mother snake, whether she would try to defend or protect them, the young snakes were frequently irritated, in order to arouse, if possible, her defensive propensities; it was all to no purpose; she seemed a heartless mother, ignoring wholly that her offspring were in danger. A long wire was often thrust into the box, and under a little snake, which could thus be dangled before the old snake in a most irritating manner. But, whether from fear on her own part, or utter indifference to the welfare of her young, she paid no attention whatever to the provocation.

The mother snake lived until the middle of October, when she succumbed to the white frosts of autumn.

A few weeks later two of the young snakes fell asleep; one of them was given to a little schoolmate, who put it in his pocket and took it to school, when, lo! and behold! the warmth from his body resuscitated it, and the "bad boy" played with it in school. To the teacher's question as to what he had, he replied, "A shoestring!"

Learning thus that possibly the remaining little snakes might sleep (hibernate) through the winter, soil, small stones, dead leaves, etc., were placed in the box, and they crept away out of sight. Whether they are dead, or only sleeping, we do not know. They

lived, however, some seven or eight weeks, were active, seemed well and happy (?) and, as far as we know, never ate a mouthful of anything during the entire time. I neglected to mention that the old snake shed her skin once during her captivity, unfortunately, it was during our absence, and we did not witness the operation.

It certainly seems strange that, with so much fasting, they none of them should look thin and poor, but should apparently grow and increase when having consumed nothing.

MRS. W. A. KELLERMAN.

Columbus, O., Jan. 9.

Geographical Variation in Birds.

IN your issue of Jan. 6 there appears a communication entitled "Geographical Variation in Birds," containing several remarkable statements, two of which I would like to correct. In speaking of "desert coloration," this writer says: "If the scorching sun of the desert regions will bleach out one species, why will it not do the same for another? The plea of adaptation of coloration for protection cannot be urged here." Such a conclusion does not follow, and the plea of protective coloration might reasonably be made, because the "bleaching" of which he speaks did not take place during one summer, but is the result of natural selection for an unknown number of generations, and, while in some species this protective coloration has proved beneficial, it does not follow that in other species with different habits natural selection would work along the same lines.

But this is only a slight error compared to the following astonishing paragraph, which I quote in full, the italics being my own: —

"Not only are colors affected, but size as well, by geographical position. This is probably more marked north and south than east and west. *And yet the variation in size alone is not sufficient for a sub-specific division* It is not at all strange that those individuals of a migratory species which push farthest north should possess stronger bones and muscles and so be larger than those which were not able to fly so far. It would seem natural that the constant recurrence of such a difference would tend in time to form a race peculiar enough to be recognized as a sub-species. *But it has not proven true thus far in the history of the world,* and why should there be any change under the same conditions?"

If the above quotation means anything, it is that the author believes increase in size to be more or less general and due to the longer migrations of originally stronger individuals, and yet that this process of selection has not up to this time produced even a tenable sub-species! Considering these two unique ideas in reverse order, let us see whether there are not some species, or at least sub-species, based solely on an increase or decrease in size. Hastily running over the list of North American birds, we find the following interesting facts: *Troglodytes alascensis* is accepted as a different species from *T. hiemalis*, but the variation is only in the size. *Accipiter velox* differs from *A. cooperi* practically in size only. *Totanus melanolensus* and *T. flaripes* are described by Coues as "precisely the same" except for size. And, lastly, *Rallus virginianus* is "a perfect miniature" of *R. elegans*, being about forty per cent smaller.

In addition to these species, we find there are at least sixteen sub-species which differ from the original stock only in size. About half of these vary from east to west, the others north and south. Furthermore, as Dr. Coues so truly says, many American representatives of European species are "larger and better birds" than their foreign relatives, but we will not include them here, because there are generally some slight differences in coloration as well. So much for the existence of sub-specific variation in size; now, as to the idea that this increase is due to migration. If it is so, how will we account for the cases already given in the genera *Accipiter* and *Totanus*, where the differing species have practically a co-extensive range; or for the even more difficult case of *Rallus*, in which the smaller species is a much more northern bird? But the best illustration to show the fallacy in both ideas is *Dryobates villosus*. Here we have a widely distributed bird, a resident, not a migratory species, which has two accepted sub-species based solely on variation in size: the northern form, *D. v. leucomelas*, larger than normal, and the southern form, *D. v. audubonii*, smaller. How can this be accounted for on the proposed "migration" theory? To sum up the whole matter, it is probable that northern birds will average larger as a rule, especially in resident species, as they are thus better fitted to stand the severity of the climate and the other difficulties of boreal existence. Furthermore, it can hardly be denied that variation in size is in a number of cases not only sufficient to denote a sub-species, but, occasionally, where the connecting links have disappeared, to form what is universally considered a distinct species.

HUBERT LYMAN CLARK.

Pittsburgh, Pa., Jan. 13.

Pseudoaurora Not Shadows.

THE explanation of the phenomena reported by me in *Science*, issue of the 16th of December, is altogether too common an observation to leave any doubt of its failure to clear up the mystery. My calling has made me very familiar with all of the "shadows cast upon the fog by projecting arms or objects in the beam from the light," as "seen at any time when there is smoke, light fog, or mist."

The phenomena which I described was entirely new to me, and apparently distinct from *shadows* of any kind, consisting of pencils of light radiating upward from a dark arc, the centre of which was somewhat east of north, the pencils constantly changing in length, and having an apparent movement laterally precisely like those of the ordinary northern lights while I remained standing still. The characteristic coloration of the pencils was unmistakable, but not as distinct as I have sometimes seen it. I have seen the "shadows" so often under similar circumstances of smoke, fog, and mist, that I should scarcely have noticed the matter but for the dark arc with its superimposed luminous arch and the radiations described. But I spent considerable time, in making the different observations mentioned before, and took in the familiar shadows that impress the mind of Professor Hazen so strongly.

P. L. HATCH.

Anacortes, Washington.

Natural Selection at Fault.

WE are generally told by orthodox Darwinians that both the structure and the actions of animals are to a great extent dependent upon natural selection. Any organ, or any habit which is not advantageous to its species will be, it is said, promptly suppressed as a possible danger, or at least, an unremunerative demand.

Yet there are a few cases of habits which seem to have been acquired or maintained in flat contradiction to this doctrine. Every one knows that the *Felidæ*, from the Bengal tiger down to our domestic mouser, when they have seized a prey do not at once kill and devour it, but either torment it or at least sit and watch it for some time before administering the fatal bite or blow. The consequence is that the victim sometimes escapes, as we all have witnessed, when pussy is playing with a mouse. One instance at least is on record where a man, struck down by a tiger, quietly drew a dagger and stabbed the assailant to the heart. This could not have been done with a beast of prey of the canine or ursine family, as they do not allow time for devising and executing such a manœuvre. Hence we see that the peculiar conduct of the cats is disadvantageous to themselves, and we ask why it has not been abandoned. Certainly any cat which should at once devour any mouse or bird which it had caught would, in times of scarcity, have a decided advantage over its fellow-cats.

Similarly injudicious is the conduct of the domestic hen. As soon as she has laid an egg she at once announces the fact to all whom it may concern by her well-known cackling. What benefit is this outcry to herself or to her species? On the contrary, the outcry is heard by animals which are given to stealing eggs and is understood by monkeys, if we may accept the evidence of La Vaillant. There again, therefore, we have a line of conduct quite contrary to what natural selection would determine.

In man, there is not, indeed, a habit, but an organ which has lost its uses, yet is still developed in every child brought into the world. The outer ear was formerly provided with muscles by which it could be turned towards any sound for its better recognition. These muscles have become obsolete by heriditary disuse, so that in all normal subjects the ear is motionless. That it could formerly be directed so as the better to receive a sound will the less be denied as it survives in certain exceptional individuals. But as it is absent in the great bulk of our species, the question arises, Why does the external ear not gradually cease to be developed? No one can now contend that it is useful.

J. W. SLATER.

London, England.

Speed of Flight of Birds.

I HAVE always been more or less of a sceptic in regard to the high rate of speed in the flight of certain birds, but I have only just obtained a bit of satisfactory evidence from my own observations. Our wild ducks are admitted to be among our strongest flyers, but I am satisfied that the buffle-head (*Charitonetta albeola*) does not attain a speed of forty miles per hour. While travelling on the Baltimore and Ohio Railway, up the valley of the Potomac, on Jan. 3, I saw a great many ducks, nearly all of which were buffle-heads. Those who are familiar with the road will recall how closely it follows the windings of the river, so that a bird flying up mid-stream would travel just the same distance as the train on the bank. It so happened that, on rounding a sharp curve, my train flushed a pair of buffle-heads, which started up stream at full speed. On watching them I found that, instead of leaving us behind, we were actually beating them, and I am confident that their rate of speed was not equal to that of the train. We kept alongside of them for nearly a minute before they turned back down-stream. Careful calculation showed that the train was running at about thirty-seven miles per hour, so that the rate of speed for those wild ducks would be about thirty-six. I hope that others may have some evidence on this question of speed in flight which will throw more light on the subject.

HUBERT LYMAN CLARK.

Pittsburgh, Pa.

Bowser's Trigonometry.

As I have learned to admire the mathematical text books of Professor Bowser from the excellent results I have had from their class room use for several years, I was surprised to see the somewhat adverse criticism of his Trigonometry in *Science* of Nov. 25. I disagree with your critic's assertion that the best way to study trigonometry is along the line of its historical development. I believe that such a course of study would be objectionable, because of the long time it would require, and because the student would be compelled to unlearn, if I may so phrase it, many things he would necessarily be called upon to learn if he followed the historical method. It is a recognized pedagogical fact that it is easier to teach correct methods to a student who has never used incorrect methods, than to one who has. To acquire a complete knowledge of trigonometry would undoubtedly require a study of its development, to acquire the knowledge required for its proper and facile use in its many applications, does not require a study of its history.

And accordingly I believe his plan of giving the best results and methods of the best students and workers in trigonometry is to be preferred to a method which requires a student to test and reject what has long before been tested and rejected. I admire Professor Bowser's plan of giving such definitions of the functions as apply to all angles, acute, obtuse or reflex. I think some of the writers on the subject have fallen into a grave error when they give definitions of the functions of acute angles, and afterward modify the definitions to suit obtuse angles.

In Professor Bowser's development of the theoretical part of the subject, he is especially clear. His book is a readable one. He is precise in his statements, and his demonstrations are such as the average student can readily follow—which cannot be said of every book on the subject.

The collection of exercises and examples is an unusually large one, suited to every requirement, while the model solutions are truly model in their methods and arrangement. His chapter on De Moivre's Theorem is more complete than is usually given in text-books, while his final chapter on the application of spherical trigonometry serves at once to show the student its use, and to give him a glimpse of several fascinating branches of mathematics.

Your critic is hardly justified in his claim that Professor Bowser has made several historical mistakes. It is unfortunate that Professor Bowser should imply that Napier was the inventor of what are now called Napierian logarithms; but surely he is right in saying that Briggs introduced the common system in 1615, since it is generally admitted that Briggs lectured on them in that year, though his tables were not published until two years later. And why your critic should object because Professor Bowser, in speaking of addition and subtraction logarithms, refers to Zech's tables, I fail to understand, since Zech's tables are equal if not superior to any others published.

Of course, only a class-room test can determine the merits of a text-book, but this latest book of Professor Bowser is so filled with the many qualities which have made his previous books so successful that I cannot see any reason why it should not meet with a like success. H. L. HODGKINS, Professor of Mathematics.

Columbian University, Washington, D. C., Jan. 5.

Humming-Bird's Food.

IN several recent numbers of *Science* there have been notices of the habit of *Trochilus colubres* feeding on the sap of different trees. I have also noticed the fact, and was interested on becoming acquainted with *T. anna* to find that it also made this a staple article of food during the summer and fall. In this part of California there are few trees yielding a sap save the cottonwood and willow.

During a mountain trip in August, 1890, I found the humming-bird very common in the willows along the creeks, at about 5,000 feet elevation; and was pleased to find that the red-breasted sap-sucker (*Sphyrapicus rufer*) filled the office of *S. varius* to the ruby-throat. The willow thickets were very dense and composed mostly of dwarfish shrubs of *Salix lariolepis*. I forced my way into the interior, and watched the birds; sap-suckers, humming-birds, and warblers (*Dendroica auduboni*), often waiting turns at a favorite drinking-spot; though possibly the latter were more interested in the insects attracted by the honey than by the honey itself. There were often three, and even four or five, humming-birds in sight at a time. They were very tame, and very curious; coming within three or four feet of me, poising themselves on their wings and looking me over. I noticed most of these were young, and that the adult males were quite shy.

Subsequently, while teaching at Dunlap, at about 3,500 feet elevation, I found the birds as late as December feeding in the same manner.

Irrigation seems to have an important influence on the habitat of this bird.

For three years I have lived most of the time in the southern half of Fresno County, in an open plain. For the first two years I saw but very few humming-birds, and never saw them feeding on the native flowers, no matter how showy they were.

Meanwhile, the water had formed a pond by sub-irrigation on the ranch, and the same variety of willow (*Salix lariolepis*), which in the valley forms a tree 40–60 feet high and 3–5 feet in diameter, had come in thickly and grown to about 15 feet in height. This fall I noticed many humming-birds about the place, and traced them to this pond.

I have never seen but one or two sap-suckers here, but I found the birds in great numbers feeding on the sap exuding from the wounds caused by a large borer, the moth of which, about two inches across the wings, colored black and white, was flying about in abundance.

I have not as yet found them feeding upon any tree save this willow. Maples are very scarce in the Sierras of this county, and the sap-suckers prefer willows to any other tree. I have not observed that the squirrels score the bark of trees here as in the

east, so the seeming preference for the willow may be owing to lack of drinking-places elsewhere.

It would be interesting to know if the other species of this genus were addicted to the same habit. Who knows?

ALVAH A. EATON.

Riverdale, Fresno County, Cal., Dec. 26.

A Peculiar Fire.

In *The Ladies' Home Journal* for January is an account of a fire from gasoline that originated in a rather peculiar manner. A lady was cleaning a Brussels carpet with gasoline. She had cleaned about one-third of the carpet when she noticed one spot that looked a little dull and which must have a little more rubbing. She says, "I gave one quick, hard rub, the cloth in my hand ignited. There was a sort of a puff, and the flames went creeping all over the carpet I had cleaned." The explanation suggested was that the friction ignited the gasoline, but no suggestion is made as to whether that was caused by raising the temperature to a high degree as might ordinarily happen by friction or whether it was otherwise.

Some of my experience in the cold, dry climate of Minnesota has suggested a very plausible explanation for this accident, which seems surprising that such accidents are not more frequent. Our sleeping-room has an ingrain carpet from which we get marked electrical experiences. On a cold morning one can hardly take a step without being strongly electrified. By shuffling across the carpet, taking only two steps, I have many times drawn a spark one-eighth of an inch long. By taking a dozen shuffling steps and touching the water faucet I have several times drawn a spark nearly one-half of an inch long. Indeed, it is so common and so excessive that it is quite uncomfortable. I have several times thought seriously of getting up some arrangement for gradually dissipating the charge on one's body, so that we can avoid the unpleasant shock when using the water. It should be stated that this high degree of electrification is not an every-day experience, but it is very common when the thermometer in the room goes below 50° or 40° Fahr.

A similar experience is very common here when one is putting on a fur overcoat or one simply with a fur collar. The simple rubbing of the fur in putting on the coat will so electrify it that one gets a prickly sensation from the charge from the collar when it is turned up against one's neck. Quite frequently simply picking up a flannel undergarment will so electrify it that one hears a decided crackling. These experiences are very common here in Minnesota with the dry atmosphere, and are quite surprising to one accustomed to the more moist climate of New York of the sea-coast.

This experience suggests at once that the gasoline in the case above noted was ignited by an electric spark caused by rubbing the carpet.

G. D. SHEPARDSON.

University of Minn., Minneapolis, Minn.

Electrical Phenomena on Mountains.

THE experience of Mr. Chariton and the relation of Mr. Stone, as given in *Science* Sept. 23 and Dec. 2, have a parallel in the account of a traveller in Italy in 1814, who is quoted in the volume of Inne's Telescope for 1827, under the heading of "Curious Effects of Electricity upon Mount Ætna," and from which I extract as under.

"June 2, 1814. Before midday two travellers were returning from the mountain, guided by Vicenza Carbonaro, one of the guides from Nicolesi. They had arrived in the Piano del Huga, when, expecting a hail-storm, they quickened their pace. Walking on frozen snow, Carbonaro was the most advanced of the party, he felt his hair stand on end, his forehead and the skin of his face felt benumbed, and he heard a hissing noise. He took off his cap and his hair became more bristled, and the whistling noise more powerful The traveller nearest to Carbonaro also heard a humming sound, and asked the guide what it was; he could not give any reason for it, and he stopped, supposing he was dizzy. In the meantime they approached each other and were pleased with the magic sound. The traveller turned to call his companion, who was at a little distance, and made a sign to him with his hand, the hand when raised produced a much stronger sound, so much so, that moving the fingers singularly modulated it. The traveller approached and heard the sound produced by the head and body of his companion, but, not having entered the current of electric air, his repeated attempts produced no sound. Finally, the three persons having joined, they experienced great pleasure, as with moving their fingers they produced the above extraordinary effect. In the meantime the hail-storm fell on them, and, being rather curious than erudite, they resolved to prosecute their journey downwards, without caring to make further investigation. Scarcely had they gone a few paces, advancing beyond the electric air, than the sounds ceased." GEO. CLULOW.

51 Belsize Avenue, Hampstead, N.W., London, Jan 2.

Maya Codices.

As the controversy between Dr. Seler and myself has drifted into mere criticisms of each others' statements, and no serious attempt to test my interpretations or to show that they are incorrect has been made, I think a continuance on this line would be unprofitable. I therefore close it, on my part, by suggesting to students of the Maya Codices that it might be worth the trouble to test my interpretations by an attempt to apply them in deciphering other combinations. I also call Dr. Seler's attention to the fact, that, notwithstanding his firm belief to the contrary, there is a numeral designation with a cross *between* the dots in the bottom line of Dres. 46, — 2 *Kayab*. Moreover, it is precisely of the form shown in his Figs. 17, 19, and 20, *Science*, Jan. 6, 1893.

CYRUS THOMAS.

Washington, D.C., Jan, 16.

BOOK-REVIEWS.

Experimental Evolution. By HENRY de VARIGNY. London and New York, Macmillan & Co. $1.50.

THROUGHOUT the whole line of biological research the progress of advance has been from statical to dynamical science. The first study is always a study of facts of nature as they exist, of their relations to each other and of their history. Later follows the study of nature in motion accompanied by experimental work and an endeavor to modify the activities of nature. Already biologists have inaugurated the science of experimental evolution, and this book by De Varigny is designed to start biologists to the study of a new science which the author calls experimental evolution. This work consists of a series of lectures originally delivered by the author before the Summer School of Art and Science at Edinburgh. The author points out that while the various lines of biological research, embryological, paleontological and morphological, all point in the direction of evolutionary theory, they fail to be conclusive demonstrations of evolution, because no one of them shows us the process of evolution in action. Evolution is an inference from the facts, but not a demonstrated truth. There is needed as a final test experimental study in regard to the production of new species by process of nature. To the discussion of the possibility of this branch of experimentation, these lectures are devoted. The author first summarizes, in an extremely interesting fashion, the chief lines of fact which have been collected in connection with variations of animals in nature. Second, in a similar way, he summarizes and discusses variations which are known in animals under domestication. Third, he endeavors to show how these variations are under the influence of conditions; conditions of environment, conditions of heredity, conditions of interbreeding, etc.; and, last, he tries to point out how it may be possible in the future for the experimenter so to regulate these conditions of environment as to cause at will actual changes to take place in the structure and characteristics of animals and plants which may result in the not too greatly distant future in the production of new species and hence in the final demonstration of a doctrine of evolution. Although largely a compilation the work is withal interspersed with many new and interesting observations made by the author in connection with the subjects discussed, the changes in the structure and

characteristics of animals brought about by the changes in conditions surrounding them. The series of lectures is extremely interesting and suggestive. It will be found to contain a most excellent summary of the important facts known in regard to variations and the conditions regulating variations in animals and plants, and it will also be found to be full of suggestions to guide further experiments in the future. The work perhaps shows some trace of lack of sufficient care and occasionally carelessness in quotations from the authors cited, but on the whole we must regard these lectures as an extremely valuable addition to our knowledge of the doctrine of evolution and possibly as a stepping-stone into a new department of investigation upon the doctrine of evolution. Especially important are they as opening a new field of research, which is so broad and yet so close at hand that there is opportunity for all to work therein with strong confidence in being able to obtain valuable results.

Text-Book of Elementary Biology. By H. J. CAMPBELL, M.D. London and New York, Macmillan & Co. $1.60.

THE last few years have seen the publication of several books on elementary biology, and those already published very satisfactorily fill the need felt by schools for such works. One can but wonder at the appearance of this new book by Dr. Campbell, especially when we see that it covers practically the same ground as some of the others and in no more satisfactory a manner. The book is entitled Introduction to the Study of Elementary Biology, but it certainly could never be used as such unless it were accompanied by a long course of lectures or by considerable assistance in practical work. The text is too condensed, the subject too crowded and everything is treated in too concise a manner to be intelligible to a student who is beginning to study elementary biology. In some places the text is scarcely more than a catalogue of anatomical details perfectly unintelligible without a large amount of outside assistance. The book is divided into two parts, the first giving general biological truths and the second giving more detailed descriptions of a few types. The author advises the student to read the two parts together and not consecutively, a precedure which most students would be sure not to follow. The author also strongly advises a student to do a considerable amount of practical work in connection with the reading, but nowhere in the book does he give any directions for such practical laboratory work, any directions for obtaining material or for using it, so that a student would be utterly unable to work in the laboratory by the use of this book alone. In short, the book as an introduction is impracticable unless it is accompanied by considerable personal direction on the part of instructors. Seemingly this book is designed chiefly for medical students, or at least so one would judge from the apportionment of space allowed to types. Of 160 pages which are devoted to types, over 55 are taken by the study of parasitic worms including leeches, 31 more with the unicellular organisms, leaving less than 30 pages for all the rest of the animal kingdom, including invertebrates; perhaps the most curious apportionment of space to be found in any text-book. While for an elementary text-book it seems to be not usable, the work does contain an interesting summary of biological principles and facts which would be instructive and pleasant reading to a person already acquainted with elementary biology and wanting an outline summary of leading biological principles. For such a purpose the book many be recommended, and will be found readable and instructive.

Physics. Advanced Course. By GEORGE F. BARKER, Professor of Physics in the University of Pennsylvania. American Science Series. New York, Henry Holt & Co. 902 p. 8°.

THIS addition to the excellent series of scientific text-books published by Messrs. Henry Holt & Co. will be welcomed by teachers of physics both on account of Professor Barker's reputation as a teacher and as an investigator.

In the preface the author states that the progress which has been made in physical science within the past decade has com-

CALENDAR OF SOCIETIES.

Chemical Society, Washington.

Dec. 8.—Subject of Discussion, National Chemical Society Plans.

Jan. 12.—Ninth Annual Meeting. Officers elected: President, Dr. F. P. Dewey; vice-presidents, Mr. Cabell Whitehead, Mr. K. P. McElroy; treasurer, Dr. E. A. de Schweinitz; secretary, Dr. A. C. Peale; additional members of executive committee, Professor H. W. Wiley, Professor F. W. Clarke, Dr. Thomas Chatard, and Professor R. H. Warder. Papers were read as follows: On Some Old Vegetable and Animal Oils, by K. P. McElroy and W. D. Bigelow. An examination had been made of thirteen oils that had formed part of the exhibit at the Centennial Exposition of 1876, with the view of determining the effect of age. The conclusion reached was that age diminishes the iodine number of oils and fats but increases the ether and free acid members. On Some Problems of Physical Chemistry, by Robert B. Warder, who submitted the following as some of the open problems. 1. What is the real nature of matter in atoms and in molecules, in elements and compounds, and in the several states of aggregation? 2. How far can the properties of each kind of matter be exposed as a function of the atoms (or other constituents) of which it is composed? 3. What are the mechanical possibilities and limitations of chemical change? Subject discussed, What May We Hope to Gain from the Congress of Chemistry at Chicago Next August.

New York Academy of Sciences, Biological Section.

Jan. 9.—A. A. Julien, Suggestions in Microscopical Technique, including (*a*) a carrier of cover impressions (mycoderm blood), utilizing as clamps a coil of brass wire moulded in a phial. The same device with a platinum coil serves as a convenient staining phial for cover-glass preparations. (*b*) A suggested medium for mounting delicately intractile protoplasmic objects. (*c*) Devices for avoiding inclusion of air-bubbles in mounts. (*d*) Balsam-paraffine as a ring varnish. O. S. Strong, On the Components of Cranial Nerves of Amphibia. In the seventh a dorsal root was shown to pass off into brain, representing Ophthalmicus, Superficialis, Facialis, and Buccalis of fishes, and innervating the lateral sense-organs of the head. In vagus a root of similar internal origin passes into the R. laterales, innervating the lateral sense-organs of the body. Another component of the facialis is the fascicalus communies of Osborn, which was believed to represent the lobus vagi of fishes. This passes off into the palatinus and mandibulaies internus, innervating the mucous epithelium of the oral cavity; while in the glosso-phangugrus and vagus similar components derived from this fasciculus innervate in like manner portions of the alimentary canal and its appendages. The relation of the results to segmentation of head was discussed. N. L. Britton, A Review of the N. A. Species of Lespedeza, With Comments on the Eleven Native Species, Shown to be Divisible into Two Groups, (*a*) those producing both petalous and apetalous flowers, and (*b*) those in which the petalous flowers are developed. Of the two naturalized species, one, in the south-eastern part the United States, L. striata (shrug) H. and A., is a native of eastern Asia, appearing (about 1848) in Georgia.

Society of Natural History, Boston.

Jan. 18—W. M. Davis and students in geological field-work in Harvard University, Report on a Study of Glacial Sand-Plains in Eastern Massachusetts (illustrated by lantern slides).

Society for the Advancement of Science, Las Cruces, N.M.

Jan. 12.—C. H. Tyler Townsend, Presiden's Annual Address: The Present Status of Science in New Mexico.

pletely changed its aspect, the physics of to-day being distinctly the science of energy. It is from this point of view that the text-book has been written, the classification which has been adopted being based on the most recent views of energy, considered as being ultimately a phenomenon of the æther. The fact is significant that more than half of the entire work has been devoted to æther-physics.

The introductory portion of the book considers, first, physical relations in general, and second, the laws of motion; the latter being discussed, first in the abstract, and second with reference to the action of force upon matter. Under mass-physics energy is first treated of as a mass-condition, and then work, as being done whenever energy is transferred or transformed; the subject of potential being developed as a consequence of mass-attraction. The properties of matter are next considered, including the modern views of its structure; and then follows the subject of sound considered as a mass-vibration. Under molecular physics the phenomena of heat alone are treated; the term heat being restricted, in accordance with modern usage, to molecular kinetic energy. Under the head of æther-physics are grouped: (1) æther-vibration or radiation, (2) æther-stress or electrostatics, (3) æther-vortices or magnetism, and (4) æther-flow or electro-kinetics; following the classification so well set forth by Lodge. Radiation is considered broadly without any special reference to those wave-frequencies which excite vision and are ordinarily called light.

The ground covered is that which is usually traversed by students in the more extended courses in physics in our leading universities, colleges, and technological institutes.

The book is well printed and well illustrated, a colored magnetic map of the United States being given as a frontispiece. The text is interspersed with examples, and descriptions of illustrative experiments in smaller type. The metric system has been used throughout, and all the units employed are those of the C. G. S. system.

Although the preface only bears date of October 1, 1892, a second edition has already been issued.

AMONG THE PUBLISHERS.

A NEW edition of Haeckel's "The History of Creation," has been issued in Germany, and a translation, revised by Professor E. Ray Lankester, is just published in this country by D. Appleton & Co. The book is a popular exposition of the doctrine of evolution in general, and of that of Darwin, Goethe, and Lamarck in particular. The reviser calls it "a statement of the views of one of the most learned, experienced, and honored naturalists of modern times." It is issued in two volumes, with numerous illustrations.

— D. Appleton & Co. publish a "Dictionary of Every-Day German and English," by Martin Krummacher, Ph.D. In addition to the dictionaries proper, it contains lists of the most important technical terms, proper names spelled differently in the two languages, a sound-notation, an outline of grammar, and several pages of "travel talk" in parallel columns.

— Ginn & Company announce "A Students' Manual of a Laboratory Course in Physical Measurements," by W. C. Sabine, Instructor in Harvard University, to be published in February. The manual will contain an outline of seventy experiments in mechanics, sound, heat, light, magnetism, and electricity, arranged with special regard to a systematic and progressive development of the subject. The description of each experiment will be accompanied by a brief statement of the physical principles and definitions involved, and a proof of necessary formulae. That the manual may be of more ready and general service a set of apparatus has been designed which is especially adapted to the course and can be found complete on the market. The book is intended for use in supplementing college courses in physics.